Study of Cloud Computing Intention of Use for Learning Improvement in Higher Education

(Case Study: Private Higher Education Institution in Jakarta)

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***Abstract*— Cloud Computing was growing so fast today. The services are Infrastructure as a Service (IaaS), Software as a Service (SaaS), and Platform as a Service (PaaS). This development of cloud computing align with the development of computer in this new age which turn people to work mobile and faster. Cloud computing could be one of the new tools in supporting learning process for students in Higher Education. In student age, they are more familiar with gadget and internet. We do not exactly know how cloud computing can be helpful for lecturer or students. We also want to know the role of cloud computing for the higher education learning process. But, before we are going to see the impact of cloud computing, for the initial stage of the study, we conducted a research to analyze the factors that influence the lecturers and students in using cloud computing to efficiency process. This research conducted using the Theory of Planned Behavior to obtain the result. Finally, the factors that affected the lecturers and students intensity of using cloud computing are attitude, behavioral control, and subjective norm. This result shows that lecturers and students ready to adopt cloud computing and they're already familiar in using it. Furthermore, institution will easier to implement cloud computing for efficiency process.**

Keywords*— *Cloud Computing, Theory of Planned Behavior, Attitude, Subjective Norm, Behavioral Control

I. INTRODUCTION

Cloud computing services adoption for organizational operational in business, government, even in education is growing rapidly. Cloud computing provides an opportunity for organization in develop country to obtain the benefit of technology without spend a lot of investment.[1]. Cloud computing is emerged as an attractive paradigm of internet service [2]. The use of cloud computing in business can help business more efficient the process by enabling the employee to working in the remote site, and also increase the productivity of the company [3]. Employees can work using netbook, tablet, or any gadgets to obtain the data stored in cloud and collaborate with other users anytime and anywhere [4]. There are many advantages of cloud computing technology today and certainly change the way in data handling, service, and the way to store/access digital content, but to obtain the best result, we need to understand, appreciate, and accept that technology at first [5].

Service provided by cloud computing open the opportunity for the organization to keep using new technology with reasonable price. Cloud computing could be an option not only for large organization but also small to medium business and startup [6], this also open opportunity for educational institution [7]. Higher education is known as learning organization and also influenced by social factor, trend, and technology. It will be better if higher education also adaptive in this globalization era. The scope of cloud computing allows the institution to deliver the materials in a new way and help students to better handle big project, this will help student to prepare their work in the future with high pressure [8]. From the organization side, cloud computing allow the institution to reduce cost in IT Infrastructure investment and operational cost. [9]. Student and administration staff can access various application platform and resources using on-demand site, and gradually this will reduce the cost of software license, hardware cost, and also maintenance cost which provide a big flexibility for college management [10].

Today's global challenge change the learning process from traditional process into high tech orientation, this also force the higher education institution to adapt into new modern technology era. Some problems faced by University in this high growth of business and societies are difficulties to provide IT service that flexible and also scalable. If they still depend on the offline storage, they are difficult to access data and depend on other department provide the data. However, by cloud computing, all of this arrangement will be integrated in cloud. Using cloud computing can increase the productivity of lecturer, faculty, students, and staff and support collaboration [11]. As a user, we need a technology that can provide good service, faster, user friendly, and also support collaboration [12]. And through this opportunity offered by cloud computing for improvement, higher education can adopt it. Before we really suggest the architecture of implementing cloud computing for the organization, first we are interested to know the factors that most influence the students and lecturer in using cloud computing in their daily activities, public cloud computing will be the object in this research. Once the students and lecturers used to and familiar using public cloud computing, it will be easy for institution in developing cloud based education industry in the future.

II. LITERATURE REVIEW

Cloud computing is a new era of technology development which offer service of storage data in cloud. Katzan [13] described cloud service system as the development of cloud application, first SaaS (Software as a Service) is service that provided the user for the use of provider application using

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cloud infrastructure, this service allow users to access the service using their devices. Second is PaaS (Platform as a Service) is described as a service that provide user to deploy the application the user created. PaaS do not allow user to control any of the infrastructure, while the third one is IaaS (Infrastructure as a Service) is a service that provided user to processing, networking, controlling the services and user is allowed to execute the software.

There are a lot of benefits offered by cloud computing and still company can also adopt it [14], such as secure storage, easy management of data, scalability and sustainability of information, dynamic, and low cost. While another said that cloud computing also offer scalability, feasibility, and resiliency [15]. This cloud computing services integration model can be described in figure 1 below.

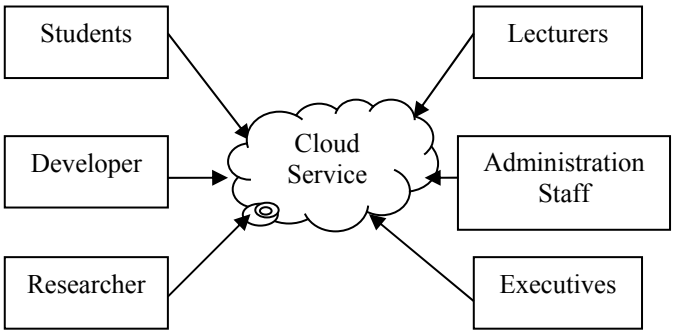

Fig. 1. Cloud Service Model

Higher education is the earlier adopter of technology nowadays. They are generation with full of creativity and enthusiastic in learning new thing. For long time ago, study and doing task is manually documented and stored. Cloud computing offers others alternative than manual which collaboration factors will be good in study. Many factors influence the intention of IT People or executives in using cloud computing. This reasons maybe come from internal or external reason. From internal factors such as acceptance, influence, trust, management, and manager while external factors such as security, privacy, reliability, lock-in, and bandwidth [16].

Several factors considered significant in influencing people to use something new, they are Attitude, Subjective Norm, and Behavioral Control [16]. This model of research has been widely used in predicting new technology adoption, we often called it as Theory of Planned Behavior [17].

Attitude is someone's belief that behavior leads to certain conditions in good or bad things [18], attitude also related to perceive of usefulness which is a measurement of someone belief that using cloud computing will increase their performance, individuals tend to use an e-commerce when they believe that using e-commerce will help them to improve their job performance [19], while subjective norm is an individual's perception of the influence by her or his environment towards new technology, the influence can come from family, friends, tutor, senior, colleagues, and many others. The other research argued that perceived of behavioral control is when the individual perceive that they actually control the behavior of interest. It is about the belief that someone has a control on something so they interest to use it because they have full control on it. [20]

. The result of research in predicting e-procurement adoption which is similar with cloud computing technology in developing country, the United Arab Emirates using Theory of Planned Behavior showed that behavioral intention towards e-procurement is determined by the user's attitude, perceived usefulness, and also subjective norm [21]. The other research also has the same result as three of the factors have positive impact to the intention of use of google docs [22].

III. Research Methodology

A. Population and Sampling Technique

The target population in this research is high institution students based in Jakarta. The sample technique used in this paper is simple random sampling with no category of sample characteristic. The data is quantitative and will be processed using SPSS software to interpret the result.

B. Data Gathering Technique

The data was collected by using questionare instrument which contain of various indicators based on variables in this research. Four variables were created in this research according to Theory of Planned Behavior described in previous section, each variable has ten indicators so total questions in the questionaire are 40 questions. The questionaires are distributed to college students and lecturers in Jakarta, Indonesia. The variables will be formed into questions and likert scale is used to measure each of the questions.

IV. Research Model

This research model was adopted from Theory of Planned Behavior from Ajzen [17] to investigate the factors that influencing the intencity of students and lecturer in using cloud computing. This research contain of three independent variables (X), they are Attitude (X1), Subjective Norm (X2), and Behavioral Control (X3) as well as one dependent variable which is Intention of Use (Y).

The model figure is described as follow:

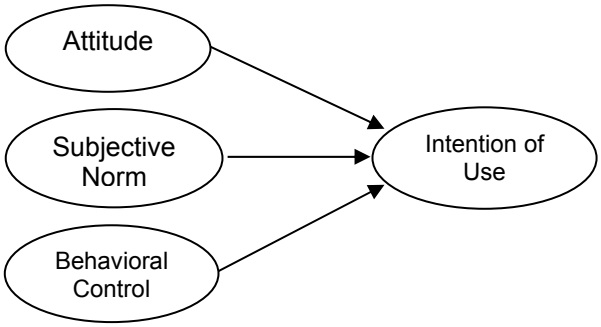

Fig. 2. Research Model

A. Hypothesis

H1: Attitude is positively influence the intention of use of cloud computing

The measurement of the first variable is intended to see the user's view of cloud computing. Attitude could be one of the factors impact users in using a technology especially cloud computing, attitude referred as individual perception and evaluation of self performance. [22]. Attitude is measured with ten statements and respondent must fill it with scale according with their opinion, the more high number of scale represent more agree with the statements.

Q1 = For me, using cloud computing is a good idea.
Q2 = For me, using cloud computing is very interesting
Q3 = I feel comfortable using cloud computing
Q4 = Cloud computing is suitable for me and my work
Q5 = I like to use cloud computing services
Q6 = Cloud computing is positive for me
Q7 = Cloud computing help me in my job and learning process
Q8 = Using cloud computing gives benefit for me
Q9 = I always try to use cloud computing service
Q10 = Using cloud computing service is my priority than other storage media.

H2: Subjective Form is positively influence the intention of use of cloud computing

Subjective Norm is the influence from people surrounding which encourage someone to doing something. Subjective norm is also defined as someone perception of social perspective of something from friends, senior, or family can influence the user of using cloud computing [22]. Subjective Norm is measured with ten statements and respondent must fill it with scale according with their opinion, the more high number of scale represent more agree with the statements.

Q1 = My senior suggest me to use cloud computing services
Q2 = My colleagues suggest me to use cloud computing services
Q3 = My friends suggest me to use cloud computing services
Q4 = My teacher/lecturer suggest me to use cloud computing services
Q5 = People around me influence me to use cloud computing services
Q6 = My acquaintance influence me to use cloud computing services
Q7 = Almost educated person use cloud computing service
Q8 = Environment support me to use cloud computing service
Q9 = I interested in using cloud computing because of the influence from electronic media/magazine.

H3: Behavioral Control is positively influence the intention of use of cloud computing

Behavioral Control is one the factor that influence the individu of using something because of the ability to control the thing [20]. Behaviral Control also give impact toward intention of using cloud computing [22]. Behavioral Control is measured with ten statements and respondent must fill it with scale according with their opinion, the more high number of scale represent more agree with the statements.

Q1 = I can use cloud computing service to finish my job
Q2 = I have enough knowledge to use cloud computing service
Q3 = I have enough resources to use cloud computing
Q4 = I have enough time in using cloud computing service
Q5 = I have capability to use cloud computing service
Q6 = I have sufficient facilities to use cloud computing
Q7 = I'll find opportunities to use cloud computing service
Q8 = I save all of cloud computing in my gadget
Q9 = Cloud computing makes my job faster
Q10 = I feel easy when use cloud computing service

V. Result and Discussion

A. Data Recapitulation

The questionaires were distributed by online media using google docs. 117 questionaires back to researcher, and these data was observed and selected to get the valid one. Finally, researcher decided to use 109 questionnaires. The data was entered into SPSS software for statistic measurement.

From this all data, 74.2% was student participation, while 25.8% was lecturers. 68.3% was male.

They all familiar with internet and cloud computing, the most popular public cloud computing they used is dropbox (88.3%) and Google docs (86.7%). These people that use cloud computing often access it through their smart phone and laptop.

We can see that, students and lecturers in this private university already familiar with cloud computing, internet, and gadget. Next we want to know what are factors affect them to use cloud computing.

B. Validity and Reliability Analysis

After all data were collected through questionnaires, it is important for us to determine the validity of the indicators to make sure that the instrument is valid to be used in the research model. We used Pearson Correlation, and the result shows that the data pass validity check.

To conduct reliability test, we test the items by looking at the alpha level. If the level of alpha is higher than 0.7, the questionnaire is reliable for this research and accepted. The result shows the alpha level of all variables above 0.7 which means the items of questionnaires are reliable to be used in this research.

C. Result

In this research, we performed multiple linear regression to identify factors influence the intention of use in cloud computing.

R value 0.796 indicates the independent variables (Attitude, Subjective Norm, and Behavioral Control) supported 79% influence toward dependent variable (Intention of Use). While R Square 0.633 indicates the variables in this research contribute 63% and the rest of it 37% is influenced by another factor that not discussed in this research.

TABLE I. MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.796[a]	.633	.623	.328

TABLE II. MULTIPLE REGRESSION RESULT

Model	B	t	Sig.
Attitude	.495	5.389	0.000
Subjective Norm	.194	2.445	0.016
Behavioral Control	.386	4.216	0.000

The result shows on table 4 above is a result of multiple regression analysis done by SPSS software. We can see that all of the variables significant level is <0.05 which mean that all of the independent variables significant to dependent variable.

Hypothesis 1 is supported. The significant level of attitude is 0.000<0.05, therefore we concluded that *Attitude is positively influence the intention of use of cloud computing* which means that the students and lecturers believe that cloud computing give benefit to them and increase their performance.

Hypothesis 2 is also supported. The significant level of Subjective Norm is 0.016<0.05, therefore we conclude that *Subjective Norm is positively influence the intention of use of cloud computing.* This means there is other people that influence someone in using cloud computing service, may be come from their senior or people in their environment.

Hypothesis 3 is supported. The significant level of Behavioral Control is 0.000<0.05, therefore we conclude that *Behavioral Control is positively influence the intention of use of cloud computing* which means that individual feel comfortable in using cloud computing because they believe they're able to use it and have full control of it, in other words they do not worry in using cloud computing.

VI. CONCLUSION

This research tried to look at the effect of attitude, subjective norm, and behavioral control towards intention of use on cloud computing for higher education stakeholders especially lecturers and students. Through the research data gathered from the survey, we have gained positive factors in influencing lecturers and students using cloud computing, they are attitude, subjective norm, and behavioral control adopted from Theory of Planned Behavior. This result shows that, as behavioral factors, they are ready and accept this technology. Since they were familiar in using this cloud computing, we're now easy to adopt this technology in higher education institution, because high chance they will accept it, and support the learning process inside the organization.

Based on the result of this three factors and all of them give positive impact, this also bring us to understand in order to support the lecturer and student to use cloud computing, we only need to motivate them to use cloud computing such as by arranging seminars or better understanding of the benefit offered by cloud computing to increase the influence. Overall this research proved that three construct of Theory of Planned Behavior significant to the user of cloud computing especially Attitude and Behavioral Control. So the institution can make a decision and plan how to influence them in using cloud computing.

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